Before the Hearings Commissioners
at Christchurch

in the matter of: a submission and further submission on the proposed Canterbury Land and Water Regional Plan under the Resource Management Act 1991

to: **Environment Canterbury**

submitter **Meridian Energy Limited**

Supplementary statement of evidence of Mark Richard James

Date: 23 April 2013

COUNSEL: AR Galbraith QC (argalbraith@shortlandchambers.co.nz)

SUPPLEMENTARY STATEMENT OF EVIDENCE OF MARK RICHARD JAMES

INTRODUCTION

1 My name is Mark Richard James.

2 My qualifications and experience are set out in my evidence in chief dated 4 February 2013.

3 As with my evidence in chief, in preparing my supplementary evidence I have reviewed the code of conduct for expert witnesses contained in part 5 of the consolidated Environment Court Practice Note 2011. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

BACKGROUND

4 I have been requested by the Hearing Panel to consider the parameters for outcomes listed in Table 1a and 1b of the Proposed Canterbury Land and Water Regional Plan. The concerns with these tables as expressed in my evidence in chief are that:

4.1 All outcomes identified in the table cannot be met 100% of the time.

4.2 Outcomes are sometimes unrealistic for the Upper Waitaki Catchment.

4.3 There is no guidance on how the parameters should be measured.

4.4 The Waitaki Catchment has some special characteristics which make generalisations very difficult. These characteristics include a multi-use catchment and significant input of glacial flour which influences the physical, chemical and natural biological features.

5 Attached as **Appendix 1** is a table with suggested tracked changes[1] to address these issues acknowledging the need for brevity and that standard methods should be available for more detail. If there are a number of such suggestions an additional table with more details on methods/approaches may be appropriate.

6 In addition I would note the following:

[1] My suggested changes are in red text and underlined in **Appendix 1**.

6.1 I would rather see these outcomes related to specific management purposes rather than straight numbers but this would involve a whole new approach.

6.2 There needs to be an over-riding statement that these outcomes must take into account natural variability.

TABLE 1A AND 1B

Table 1a – Outcomes for Canterbury Rivers

7 Dissolved oxygen [min saturation] (%) - daily median or equivalent - 90 and 70% are appropriate.

7.1 *This allows for the diurnal change in dissolved oxygen in rivers and continuous measurements or spot measurements once a day which would be at an appropriate time equivalent to median.*

8 Temperature [max] (°C) - 90th percentile for daily max assessed on an annual basis.

8.1 *The 90th percentile allows for occasional excursions over the stated temperature in a hot summer, as was the case last year in the Waitaki.*

9 Chlorophyll a [max biomass] (mg/m^3) - 90th percentile for monthly max biomass assessed on an annual basis.

9.1 *The monthly biomass allows for a short duration of max biomass over summer. It should also be noted that systems impacted by didymo could easily exceed the max on occasions as we see in the uncontrolled Mararoa River.*

10 Fine sediment – [maximum cover of bed] * Note in text or footnote to say this excludes systems naturally influenced by high sediment load from glacial flour.

11 All river management units:[2]

11.1 Changes need to be significant not "any" change as shown in Table 1a.

11.2 Existing passage for migratory fish species is maintained unless restrictions are required to protect populations of native fish.

[2] Note this relief sought was in Meridian's original submission and is included in this supplementary statement of evidence for completeness.

(a) *This allows for existing changes due to consented operations as well as trap and transfer and other management options.*

11.3 Existing continuity of river flow is maintained from source to sea, without reaches being induced to run dry.

(a) *This allows for existing consented areas of no flow eg Pukaki River.*

Table 1b – Outcomes for Canterbury Lakes

12 Some of the following suggestions could be incorporated in the heading, text or footnotes depending on how many other suggestions are incorporated.

12.1 Dissolved oxygen [min] (%) - 90% for epilimnion is appropriate but I am not sure 70% for hypolimnion is appropriate for small lakes which stratify, but I do not have the data to assess this.

12.2 Temperature [max] (^{o}C measured monthly for top 10-15 m in large lakes or epilimnion in small lakes). ** Footnote that temperature should be max of 20^{o}C unless data shows epilimnion is naturally over 20^{o}C in summer.

(a) *This allows for small coastal lakes that may get over 20 naturally.*

12.3 Lake SPI [min grade] - does not apply to lakes naturally influenced by glacial flour.

12.4 Trophic Level Index (TLI) [max score] - score for top 10-15m water depth or epilimnion, monthly over summer. Secchi disk not included in lakes naturally influenced by glacial flour - ** Footnote that these are maximum scores and management must take into account sufficient buffer to prevent these being reached.

12.5 Colour – does not apply to systems influenced by glacial flour.

13 These recommendations allow for the special characteristics of the Waitaki system and natural variability.

Dated: 23 April 2013

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Dr Mark Richard James

APPENDIX 1

Table 1a Outcomes for Canterbury Rivers

Management unit	Sub-unit	Ecological health indicators			Macrophyte indicators	Periphyton Indicators			Siltation indicator	Micro-biological indicator
		QMCI* [min score]	Dissolved oxygen [min saturation] (%) - daily median or equivalent	Temperature [max] (°C) - 90th percentile for daily max assessed on an annual basis	Emergent macrophytes [max cover of bed] (%)	Total macrophytes [max cover of bed] (%)	Chlorophyll a [max biomass] (mg/m2) – 90th percentile for monthly max biomass assessed on an annual basis	Filamentous algae >20mm [max cover of bed] (%)	Fine sediment ~~<2 mm~~ <0.0625mm diameter [max cover of bed] (%)	Suitability for contact recreation [SFRG*]
Natural state		Rivers are maintained in a natural state								
Alpine - upland		5 - 6	90	20	No value set	No value set	50	10	10 - excludes rivers naturally influenced by glacial flour	Good
Alpine - lower							120	20		Good to Fair
Hill-fed - upland							50	10	15	Good
Hill-fed - lower							200	30		Good to Fair
	urban	3.5							20	No value set
Lake-fed		6					200	30	10	Good
Banks Peninsula		4 - 5					120	20	20	No value set
Spring-fed - upland		6			20	30	50	10	10	Good
Spring-fed – lower basins		5			30	30	200	30		Fair
Spring-fed - plains		4.5 - 5	70		30	50	200	30	20	No value set
	urban	3.5			30	60	200	30	30	No value set
All river management units		Toxin producing cyanobacteria shall not render the river unsuitable for recreation or animal drinking water.								
		Fish shall not be rendered unsuitable for human consumption by contaminants in a river.								
		The natural colour of the water in a river shall not be significantly altered.								
		Natural frequency of hāpua, coastal lake, lagoon and river openings is not significantly altered.								
		Existing ~~P~~passage for migratory fish species is maintained unless restrictions are required to protect								

		populations of native fish.
		Natural continuity of river flow is maintained from source to sea, without reaches being induced to run dry, except where continuity is affected by existing hydro electricity infrastructure.
		Variability of flow, including floods and freshes, avoids significant flat-lining, enables fish passage and mobilises bed material.

*Key:
QMCI = quantitative macroinvertebrate community index

SFRG = Suitability for Recreation Grade from Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas 2003

Table 1b Outcomes for Canterbury lakes

Management Unit	Ecological health indicators				Eutrophication indicator	Visual quality indicator	Microbiological indicator
	Dissolved Oxygen [min] (%)		**Temp [max] (°C)** **	**Lake SPI* [min grade]** – does not apply to lakes influenced by glacial flour	**Trophic Level Index (TLI)* [max score]** **	**Colour**	**Suitability for contact recreation [SFRG]***
	Hypo-limnion	Epilimnion					
Natural state	Lakes are maintained in a natural state						
Large high country lakes	70	90	19	Excellent	2	The natural colour of the lake is not altered by more than five Munsell Units – does not apply to systems naturally influenced by glacial flour	Good
Small to medium high country lakes				High	Maori Lakes and Lakes Emily, Emma, and Georgina 4		Good
					All other small to medium sized high country lakes 3		
Coastal lakes				Moderate	Coopers Lagoon/Muriwai 4		No value set
					All other coastal lakes 6		

Artificial lakes – on river				High	3		Good
Artifical lakes – others	20	Suitable for the purpose of the lake			4		Suitable for the purpose of the lake
All lake management units	Toxin producing cyanobacteria shall not render the lake unsuitable for recreation or animal drinking water						
	Fish shall not be rendered unsuitable for human consumption by contaminants in a lake						

*Key:

Lake SPI = Lake Submerged Plant Indicators from Clayton J, Edwards T, (2002) LakeSPI: a method for monitoring ecological condition in New Zealand lakes (Technical report version 1 Report by NIWA)

TLI = Trophic Level Index from: Protocol for Monitoring Trophic Levels of New Zealand Lakes and Reservoirs (Report by Lakes Consulting, March 2000)

SFRG = Suitability for Recreation Grade from: Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas, Ministry for the Environment, June 2003

** Note that:

Temperature measured monthly for top 10-15 m or epilimnion in small lakes. Temperature should be max of 20°C unless data shows epilimnion is naturally over 20°C in summer.

TLI is score for top 10-15 m water depth or epilimnion, monthly over summer.
TLI are maximum scores and management must ensure a buffer to make sure these are not reached.
Secchi disc not included in TLI for lakes naturally influenced by glacial flour.